Oudenaarde 1708
battlefield survey November 2007

Initial analysis of early modern bullets

Introduction

The small scale pilot project was undertaken to establish whether, within the area currently accepted as the site of the battle, significant unstratified archaeological evidence exists. The work was conducted on the 8th – 10th November 2007 by the Battlefields Trust survey team, directed by Glenn Foard, in collaboration with archaeologists from the Ename Centre and with the assistance of Erik Waulters and Phillipe Levrau. The work was observed by an archaeologist from the Flemish Antiquities Service.

Background

Battle:	Oudenaarde
Date:	11 July 1708.
Location:	The town lies on the river Scheldt, 19 miles south-west of Ghent and 37 miles west of Brussels. The battlefield area lies north of the town.
War:	The War of the Spanish Succession;
Campaign:	Netherlands Campaign of 1708
Object:	Marlborough was trying to regain the territorial losses of early 1708 by forcing action on the French army.
Sides:	The Duke of Marlborough and Prince Eugene leading the Allied army. Marshal Vendome and the Duke of Burgundy commanding the French.
Forces:	Allies: 85 battalions; 150 squadrons. Total: 80,000. French: 90 battalions; 170 squadrons. Total: 85,000.
Casualties:	Allies: 4,000 killed and wounded. French: 15,000 French casualties, including some 9,000 prisoners.
Result:	A heavy defeat for the French which ultimately led to the Allied recapture of Ghent and Bruges and the fall of Lille.

Methodology

The methodology for the Oudenaarde survey was based upon that applied in the Edgehill battlefield survey.[1] Detectors used in the survey were all Minelab machines: D Beaumont: Explorer Se; Glenn Foard: Explorer II; Lee Macfarlane: X-terra; Bryn Gethin: Quattro.

In each field transects are laid out 10m intervals aligned parallel to the most convenient field boundary. Each detectorist made a single traverse across the field along a survey transect, when reaching the end of the field they then moved on to the

[1] Foard, 2008

next un-worked transect to return. The reconnaissance speed was circa 12m per minute, excluding digging time. This was intended to provide a consistent sample of the artefacts across the survey area. GPS units were attached to the stem of each detector to log the detector location every 15 seconds, providing a detailed record of the intensity of survey coverage, as well as to record the location of each artefact recovered.

Detecting was undertaken in discrimination mode to recover only non-ferrous artefacts as the primary objective of the survey was to recover the distribution of lead bullets. These artefacts were separately bagged when found and the GPS used to record a 'waypoint'. The finds bags were annotated with the detectorist's initials and the waypoint number so that it can later be correlated with the GPS data downloaded into the GIS. Brief notes were made as to the land use, soil conditions of the field, weather and other information relevant for the understanding of the effectiveness of the detecting on each field on each day. These records have been submitted as part of the digital archive of the project.

The GPS data was downloaded into MapInfo GIS using GPSUtility download software, with separate files, one for waypoints and another for tracks, each recorded against the detectorist's name. These txt files are supplied with the digital archived. The waypoint data has been correlated with the finds, once washed and re-bagged, and a finds number allocated and the data entered onto the GIS and the find number and a locational reference added to the bag. The GIS finds data set is presented as part of the digital archive.

Except where the artefacts were found to be fragile all the finds were cleaned by gently brushing with a soft toothbrush in water to ensure removal of soil. Each artefact, when fully dry, has been stored in a sealable bag, pierced towards the top to enable air circulation, and with a 3mm thick square of plastozote foam to provide protection and to enable the bags to be stored standing upright. The white write-on strips will be marked with Staedtler Lumocolor permanent Art Nr 313-5 black pens 0.4mm. Tyvek labels have been placed in each bag and marked with the find number, date, finder and GPS waymark number, using Sakura (XSDK005#49) 0.20mm pen. The individual artefacts are not marked.

The non-bullet finds have not be analysed. The lead bullets have been subject to a rapid assessment and cataloguing. That catalogue is provided as a Word document. A full analysis of and reporting on the bullets was not considered necessary to fulfil the requirements of the pilot project but should a full survey be initiated then a comprehensive analysis of each bullet would be required. The present summary report reviews the character of the bullet assemblage and presents the overall distribution in GIS but this data will need to be presented against a background of modern digital mapping of the landscape by the ENAME Centre team to complete the report as this digital data was not available in the compiling of the present report.

Bullet analysis

A total of 61 certain and 6 possible bullets were recovered. The calibre of the bullet assemblage has been summarised in a graph at 0.5g interval. This demonstrates a

number of discrete bores of weapon were in use but no attempt has been made to correlate the peaks on the graph with particular classes of weapons. However comparison with the evidence from the 1642 battle of Edgehill shows that Oudenaarde has a very different calibre signature, with an absence of larger musket calibres. It may in future be possible to some degree to distinguish the bullets fired by different armies, but this cannot be assessed at present because no comparative data for French or allied armies from the early 18th century are currently available from other battle or siege sites, nor unfired bullet assemblages from excavation of magazines. The nearest comparative data set is that from the Ballymore siege site in Ireland from 1690 but this also shows almost no correlation with the Oudenaarde graph.

Many of the bullets show a high degree of masking of attributes of manufacture and use due to thick lead carbonate corrosion deposits and in a limited number of bullets a substantial degree of erosion of these deposits and occasionally fragmentation of the bullet surface. The general lack of manufacturing details of sprue location and mould line mean that accurate linear measurement of calibre of bullets will be difficult because the bullets cannot be correctly orientated to distinguish width from depth. In addition the relatively high proportion of bullets showing major or massive impact damage means that a significant number can only be measured for weight. IN addition with some there may have been significant weight loss as a result of spalling on impact and so the massively impacted balls may not yield representative weights of the original munition and so these could be isolated in the examination of the calibres present, but this would only be worthwhile with a large assemblage and as part of a full battlefield study.

The degree of major or massive impact damage is unusually high compared to other sites studied while the frequency of impact cuts and the number of superimposed cuts seen on some bullets is also exceptionally high. This implies ground conditions at the time of the battle dissimilar to those seen on the other battlefields studied. With microscopic examination the presence of embedded grains of soil or stone might enable the nature of the surface, whether ploughed or vegetation covered, to be determined in part or all of the site. However this will require more extensive experimental research on impact evidence than has so far been conducted.

A relatively small number of bullets are in poor to bad condition as a result of erosion or fragmentation, which will have led to limited weight loss impacting on the calibre measurement. However the majority of the bullets are only in fair condition and the masking of detail by the thick corrosion deposits will limit the scale of analysis possible in the assemblage. This may however be to a considerable extent offset by the fact that there is such a high degree of very clear impact damage, enabling fired bullets to be in most cases distinguished from potentially unfired bullets. Something that on many other battlefields is dependent on the identification of firing evidence.

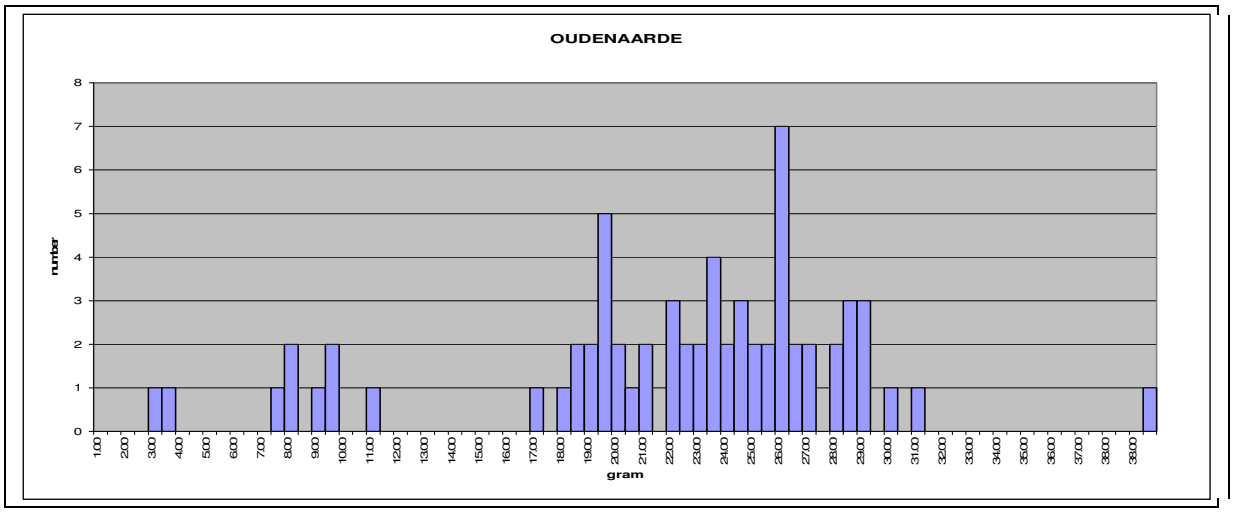

Figure 1: Oudenaarde 2007 calibre graph showing the number of bullets at 0.5g interval revealing several distinct bullet sizes in use

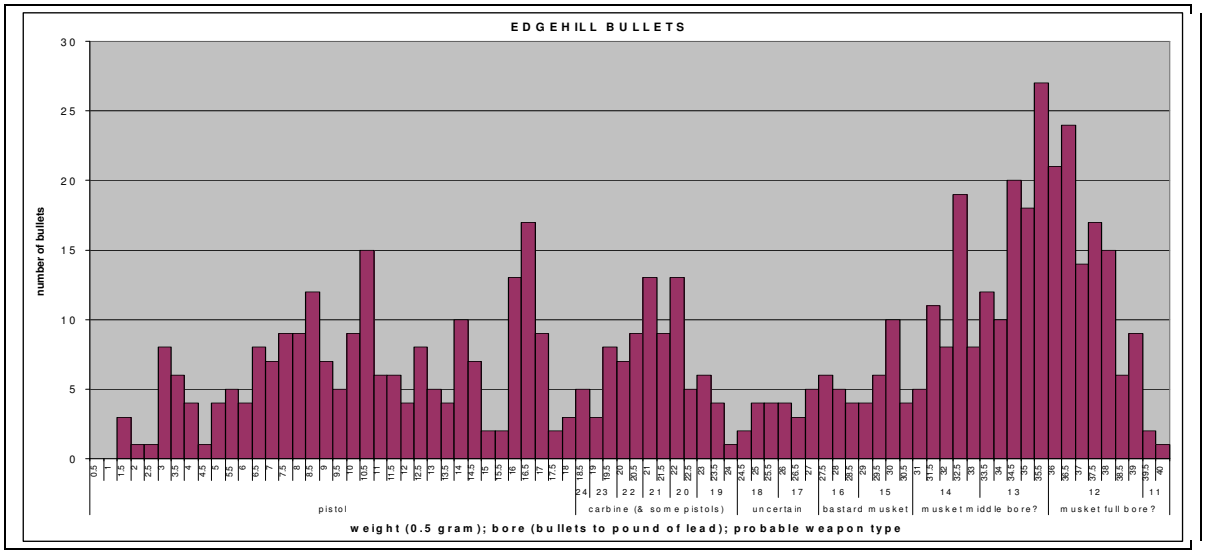

Figure 2: Comparative calibre graph at 0.5g interval - Edgehill (1642, England) battlefield survey 2004-7

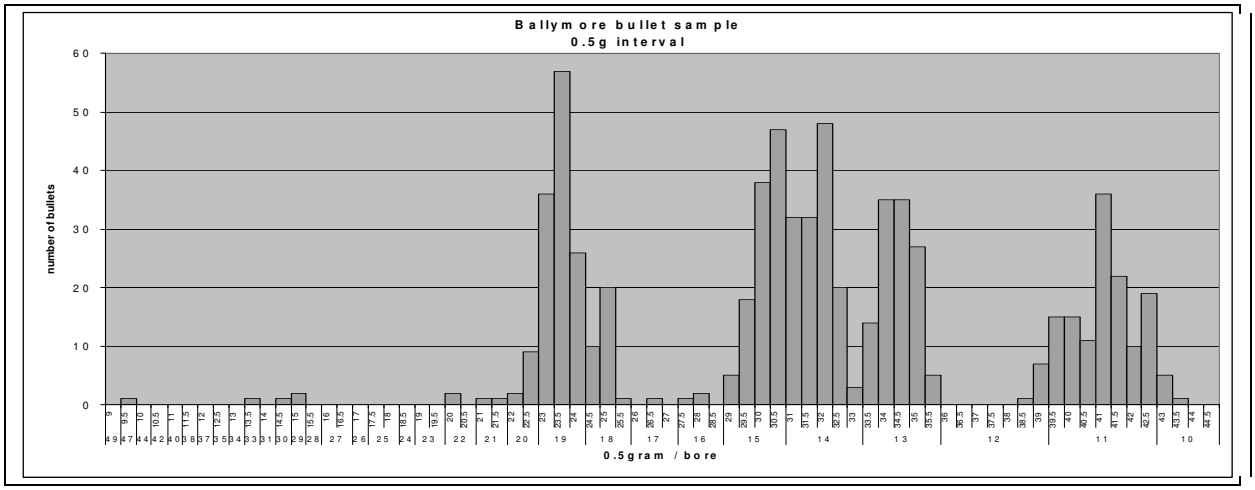

Figure 3: Comparative calibre graph - Ballymore (Ireland 1690) siege site magazine assemblage

Spatial patterning

Only a relatively small area was sampled and this scattered widely across the battlefield. Thus meaningful patterning should not be expected. However certain broad variations can be seen. The absence of finds in Field 4 is explained by the presence of modern disturbance, a 20th century farm having been demolished here and so not representative of the overall patterning.

Note: all data is georeferenced and can be superimposed on to a digital map base but this was not available when the present report was compiled.

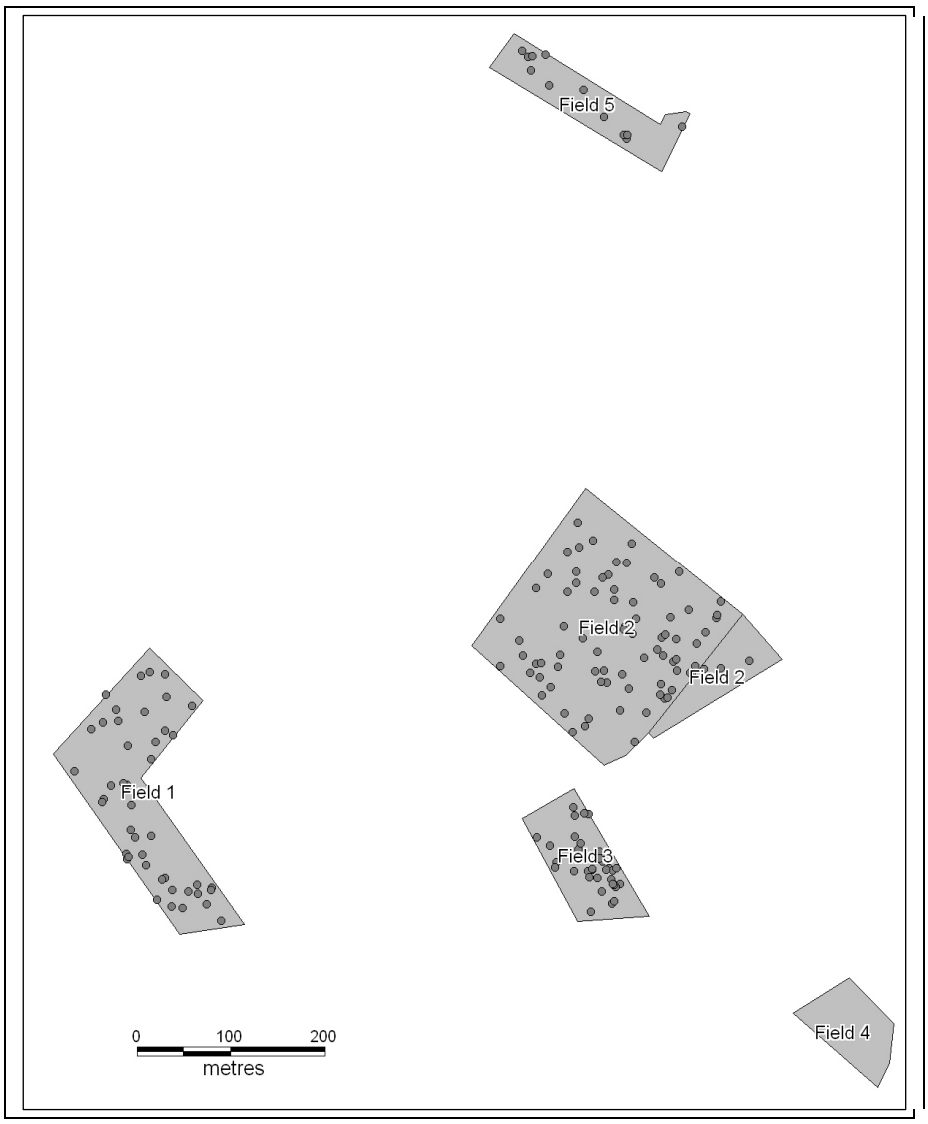

Figure 4: Survey areas with distribution of all finds

Figure 5: Bullet distribution compared to all other finds

The bullets do not show a very distinct variation in density of distribution when all viewed together as a class. However there are potentially significant variations when the calibre graph is used to divide the assemblage into potentially meaningful groups as presented in figure 6. Here there is a trace of east-west bands of 22-27 gram bullets. Also of particular interest is the way in which the four bullets identified as problematic but possibly representing case shot, are found in a cluster in field 2, tending to support the very tentative case shot identification.

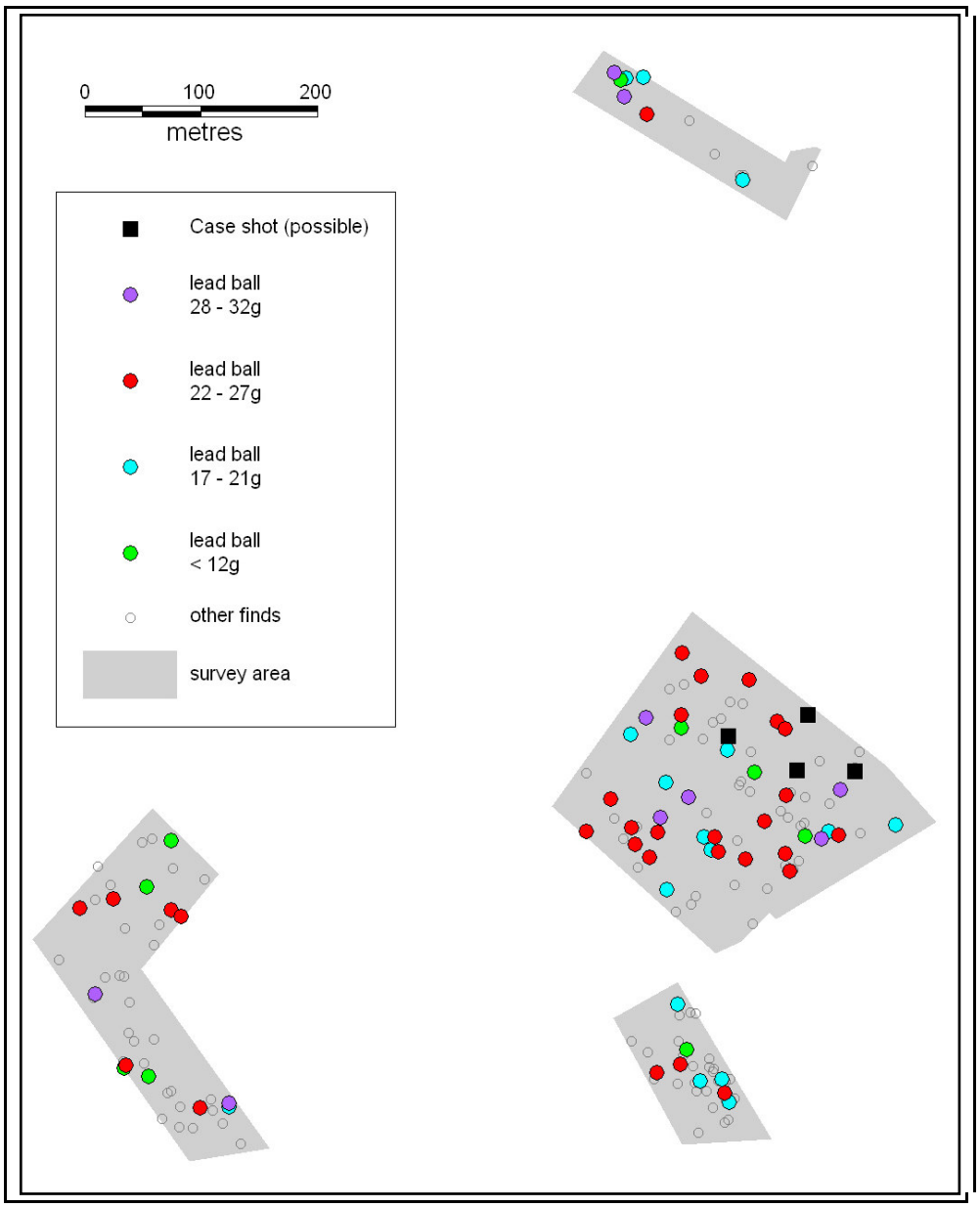

Figure 6: variation in distribution of calibres and types

Conclusions

The recovery of 61 certain and 6 possible bullets confirmed the presence of battle archaeology in the areas sampled. The small scale sampling has demonstrated that distinctive calibres of bullet are distinguishable in the calibre graph and that these grouping may yield significant pattering across the battlefield. The presence of bullets which may represent case shot fired by artillery, if confirmed by further work, would be particularly valuable in interpreting the deployments and action. However it must be noted that some limitations in bullet analysis are likely as a result of the bullets not surviving in the best of condition, though this would not preclude a meaningful study.

Discussion with various local residents also revealed that recreational metal detecting has taken place and continues on the battlefield but the scale of that activity and the

degree of damage caused to the all important patterning of the bullet distribution has not been determined. The present study suggests that sufficient numbers of artefacts survive to enable meaningful results to be achieved but that continued loss to non-archaeological recovery will progressively erode the evidence.

BULLET CATALOGUE

The terminology used here is broadly that defined in the Edgehill battlefield study but the full range of classification and analysis used there has not been applied in this rapid assessment.[2]

(Note: An error has been noted in the find number on the bags and GIS record for some artefacts. All find numbers have been amended with a decimal but the finds bag numbering needs to be correlated to the GIS file, bullet catalogue and Excel weight spreadsheet, with reference to the date, finder name and waymark number as recorded on the find bags. This is best done with ALL the finds bags available)

FIND NO	IMPACT EVIDENCE	FIRING EVIDENCE	CONDITION	MANUFACTURE	WEIGHT (gram)
1	Major: distorted sphere; cuts some superimposed	Double band	Fair: thick corrosion; slight erosion	Sprue snip up; mould ridge	25.37
7	*Probable bullet: Massive: sphere distortion ODD*		*Fair: thick corrosion; slight erosion*		18.76
8	NONE	UNCERTAIN IF FIRED	Bad: thin corrosion; bobbles of deep corrosion and some fragmentation and deep pitting		20.58
12	Massive: irregular facet; many cuts		Fair: thick corrosion; slight erosion		23.7
18	Massive: irregular facet; deep gouge		Fair: thick corrosion; slight erosion		26.58
22	Minor: irregular facets probably from impact DIFFICULT		Fair: thick corrosion; erosion		7.87
25	Massive: concave irregular facet; cuts		Fair: thick corrosion; erosion		17.43
36	*Possible bullet: Massive: extreme melt with striation and loss of form: possibly wood impact?*		*Fair: thick corrosion; slight erosion*		19.28
37	Minor: cuts		Fair: thick corrosion; erosion; fragmenting;	Sprue snip down; latitudinal lines;	21.46
39	Major: cuts, many; distorted sphere		Fair: thick corrosion; slight erosion		24.53
40	Minor: Cuts;		Fair: thick corrosion;		26.37

[2] Foard, 2008

	gouges		slight erosion		
41	*Possibly a bullet Massive*		*Poor: thick corrosion, eroding and fragmenting*		8.03
42	Minor: cuts; slight gouges	Slight band	Fair: thick corrosion; slight erosion		23.75
43	Minor: Cuts; deep gouge, broad gouge		Fair: thick corrosion; slight erosion		25.58
44	Minor: cuts, many;		Fair: thick corrosion; slight erosion		22.27
45	Major: Cut; large irregular facet		Fair: thick corrosion; slight erosion	Sprue snip up, faint	27.49
46		Massive striated band; dome top; flat irregular base pssibly from wadded firing	Fair: medium corrosion; no erosion		11.22
47	Minor: cuts; facet	Drum with asymmetrical opposed facets, possibly lower is firing facet; ODD	Fair: thick corrosion; slight erosion		20.14
48	Minor: cut;		Fair: thick corrosion; slight erosion	Sprue snip up; mould ridge	8.19
49	Massive (weight loss?)		Fair: thick corrosion; slight erosion		9.05
50	Massive: cut; facet		Fair: thick corrosion; slight erosion		24.69
51	Massive	Slight banding	Fair: thick corrosion; slight erosion	Sprue snip down	29.28
52	Massive (soil impact facet?); cuts		Fair: thick corrosion; slight erosion		29.27
56	*Possible bullet: Massive impact*		*Fair: thick corrosion; slight erosion*		20.38
57	Minor: wide cuts;	Band 40%; compressed lower hemisphere;	Irregular slightly pitted surface - ODD		28.68
58	Cuts; gouges;	Slight band? Pitted lower hemisphere?	Fair: thick corrosion; slight erosion		27.12
60	Minor: Faint cuts		Fair: thick corrosion; slight erosion	Sprue snip up; slight mould ridge	9.57
62	Major: irregular facet; cut	Slight band	Fair: thick corrosion; slight erosion		28.36
63	Minor: cuts	Irregular possibly melted surface: unlikely to be Case shot; ODD	Fair: thick corrosion; slight erosion		19.77
64	Cut		Fair: thick corrosion; slight erosion	Sprue snip down	19.92
144	Minor: cut?		Fair: thick corrosion; erosion	Major sprue snip down; high mould ridge; irregular casting?	3.99
145	*Probable bullet: Massive: sphere distortion*		*Bad: Thick corrosion; bobbles, pitting and erosion;*		9.76
146	Minor: cuts	4 indistinct facets with melting – possible case shot	Fair: thick corrosion; slight erosion		39.14
147	Modern damage		Poor: Fair: thick corrosion; erosion;		26.2
148	Massive: facet; sphere distortion; small cuts;		Fair: thick corrosion; slight erosion		25.27
149	Minor: cuts		Fair: thick corrosion;	Sprue snip down; faint	28.1

			erosion	mould ridge	
150	Major: distorted sphere; cuts		Fair: thick corrosion; erosion	Mould offset;	19.35
151	Massive: irregular facet; cuts		Fair: thick corrosion; erosion		29.21
152	Major: irregular facet; cuts; modern damage		Fair: thick corrosion; slight erosion		24.48
153	Massive: large facet with striation	Irregular large rounded facets on rectilinear munition – probable case shot	Fair: thick corrosion; erosion		23.42
154	Massive: facet; cuts;	Possible band	Fair: medium corrosion; slight erosion		26.23
155	Minor: cuts; facet?; modern gouge;		Poor: thick corrosion; extensive erosion		21.13
156	Minor: cuts	4 slight rounded facets – possibly case shot	Fair: thick corrosion; erosion		19.56
157	Major: impact facet?; cuts; gouges	Opposed double facet – may be partly firing evidence - ODD	Fair: thick corrosion; slight erosion		26.43
158	Minor: cut; opposing facets – uncertain origin DIFFICULT		Medium corrosion; erosion with probable fragmentation	Possibly burred but probably damage;	23.12
159	Major: sphere distortion; gouges; cuts	Band 30% circumference	Fair: thick corrosion; erosion		28.99
160	Minor: small gouges;		Fair: thick corrosion; slight erosion	major snip down; slight mould ridge; extreme equator ridge – could this be a 90 degree sprue mould? ODD	26.85
161	Major: distorted sphere; cuts;	Possible band	Fair: thick corrosion; slight erosion		23.51
162	Major: distorted sphere; cut, small gouges	Possible lower hemisphere radial melt;	Fair: thick corrosion; slight erosion		25.74
163	Major: sphere distortion; facet;	Possible striated band	Fair: thick corrosion; slight erosion		24.6
164	Major: sphere distortion; cuts		Fair: thick corrosion; slight erosion		26.04
165	Massive: striated facet; spalling?		Fair: medium corrosion; slight erosion		22.42
166	Major: 3 facets (or case shot facets)	DIFFICULT: MIGHT BE CASE SHOT	Fair: thick corrosion; erosion; modern damage	Sprue snip down, major;	28.85
167	Massive: double facet;		Fair: thick corrosion; slight erosion		26.28
168	Minor: facet?		Fair: medium corrosion	Major sprue snip down; mould ridge; large moulding fault; latitudinal lines	22.84
169	Massive: facet, swaged & spalled;		Fair: medium corrosion; erosion	Mould ridge	24.2
171	Minor: cut		Fair: thick corrosion; slight erosion	Heavily bitten?; irregular misshapen sphere	19.75
172	Massive: facet; modern damage; cuts and slight pitting		Fair: thick corrosion; slight erosion		31.13
173			Bad: pitted, fragmenting DIFFICULT		22.93

174	Massive: facet with spalling; cuts		Fair: thick corrosion; slight erosion		23.72
175	Massive: facet swaged & striated; gouge		Good: thin corrosion;		30.27
176	Minor: gouge?		Bad: thick corrosion; erosion; fragmentation; irregular surface		26.02
177	Minor: cuts		Fair: thick corrosion; slight erosion	Sprue snip down; mould ridge	18.02
178			poor: thick corrosion; bobbled, pitting, erosion	Sprue snip up; slight mould ridge	19.58
179	Minor: cuts; possible sphere distortion		Fair: thick corrosion; erosion	Sprue snip up; faint mould ridge	18.81
180	Minor: cuts?		Fair: thick corrosion; erosion	Sprue snip down; slight mould ridge	22.34
196	*Possible bullet: Massive: opposing faces – asymmetrical*		*Fair: thick corrosion; erosion*		3.33

BIBLIOGRAPHY

Foard, G. 2008 'Integrating the physical and documentary evidence for battles and their context: A Case Study from 17th Century England' In *PhD in Centre of East Anglian Studies*University of East Anglia, Norwich.